Notice of Allowability	Application No.	Applicant(s)	
	10/684,262	MORITA ET AL.	
	Examiner	Art Unit	
	Kandasamy Thangavelu	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *March 15, 2007*.

2. ☒ The allowed claim(s) is/are *1-3,7-12 and 14-24*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☒ Other *Clean copy of Allowed Claims*.

DETAILED ACTION

Introduction

1. This communication is in response to the Applicants' communication dated March 15, 2007. Claims 1-5, 7-8, 10-14 and 17-21 were amended. Claims 1-25 of the application are pending.

Examiner's Amendment

2. Authorization for this examiner's amendment was given in a telephone conversation by Mr. William Daley, Jr on April 26, 2007.

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to the applicants, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

3. In the claims:

Replace claims 1-3 with:

1. A gear driving system designing system, comprising:

a computer comprising:

one or more processors;

a memory storing a program logic; and

a display terminal; and

a manufacturing unit connected to the computer;

the program logic comprising:

a setting means for setting one or more gear characteristic values for the gear driving system, the gear characteristic values indicating characteristics of a final gear and a driving gear in the gear driving system for simulation of oscillations in the final gear of the gear driving system;

a calculating means for simulating oscillations in the final gear of the gear driving system, based on the one or more gear characteristic values set by the setting means;

a judging means for judging whether or not the simulated oscillations in the final gear determined by the calculating means are within acceptable ranges;

a setting changing means for changing the one or more gear characteristic values set by the setting means, when the judging means judges that the simulated oscillations in the final gear do not fall within the acceptable ranges;

means for causing said setting changing means, said calculating means, and said judging means to repeat their respective functions until the simulated oscillations in the final gear are judged to fall within the acceptable ranges by the judging means; and

wherein when said judging means judges that the simulated oscillations in the final gear are within the acceptable ranges, the one or more gear characteristic values corresponding to the simulated oscillations are output from the designing system to a manufacturing unit for manufacturing the gear driving system or to the display terminal.

2. The gear driving system designing system as set forth in claim 1 wherein the calculating means includes:

an equation creating means for creating equations of oscillation motion for a predetermined oscillation system in the gear driving system, using the one or more gear characteristic values set by the setting means;

an equation analyzing means for solving the created equations of oscillation motion to determine a plurality of oscillation frequencies and a plurality of oscillation amplitudes of the oscillation system, and

wherein the judging means judges that the simulated oscillations in the final gear are within the acceptable ranges when at least one of the plurality of oscillation frequencies and the plurality of oscillation amplitudes determined by the equation analyzing means falls within its plurality of acceptable ranges.

3. The gear driving system designing system as set forth in claim 2, wherein the oscillation system used in the equation creating means is a gear pair of the final gear and the driving gear of the final gear in the gear driving system.

Cancel claims 4-6.

Replace claims 7-12 with:

7. A computer implemented method for designing a gear driving system comprising:

a setting step of setting one or more gear characteristic values, for the gear driving system, the gear characteristic values indicating characteristics of a final gear and a driving gear in the gear driving system for simulation of oscillations in the final gear of the gear driving system;

a calculating step of simulating oscillations in the final gear of the gear driving system, based on the one or more gear characteristic values set in the setting step;

a judging step of judging whether or not the simulated oscillations in the final gear are within acceptable ranges;

a setting changing step of changing the one or more gear characteristic values previously set in the setting step, when the judging step judges that the simulated oscillations in the final gear do not fall within the acceptable ranges; and

wherein the setting changing step, the calculating step, and the judging step are repeated until the simulated oscillations in the final gear are judged to fall within the acceptable ranges in the judging step, and

when the simulated oscillations in the final gear being judged fall within the acceptable ranges, outputting the one or more gear characteristic values to a manufacturing unit for manufacturing the gear driving system or to a display terminal.

8. The computer implemented method as set forth in claim 7, wherein the calculating step includes:

an equation creating step of creating equations of oscillation motion for a predetermined oscillation system in the gear driving system, using the one or more gear characteristic values set in the setting step; and

an equation analyzing step of solving the equations of oscillation motion created in the equation creating step, to determine a plurality of oscillation frequencies and a plurality of oscillation amplitudes of the oscillation system, and

wherein it is judged in the judging step that the oscillations in the final gear are within the acceptable ranges when at least one of the plurality of oscillation frequencies and the plurality of oscillation amplitudes determined by the equation analyzing step falls within its plurality of acceptable ranges.

9. The computer implemented method as set forth in claim 8, wherein the oscillation system used in the equation creating step is a gear pair of the final gear and the driving gear of the final gear in the gear driving system.

10. The gear driving system designing system as set forth in claim 1, wherein when the setting changing means causes the changing of the one or more gear characteristic values set by the setting means, the setting changing means also causes the calculating means to simulate another set of oscillations in the final gear of the gear driving system, based on the changed one or more gear characteristic values and the judging means judges whether or not the simulated oscillations of the another set in the final gear determined by the calculating means are within an acceptable ranges and the setting changing means changes the one or more gear characteristic

values, when the judging means judges that the simulated oscillations of the another set in the final gear do not fall within the acceptable ranges.

11. The gear driving system designing system as set forth in claim 10, further comprising an output means that outputs the one or more gear characteristic values set in the setting means when the judging means determines that the simulated oscillations are within the acceptable ranges or the changed one or more gear characteristic values when the judging means determines that the simulated oscillations of the another set are within the acceptable ranges.

12. The gear driving system designing system as set forth in claim 1, wherein a plurality of gear characteristic values are set by the setting means for the gear driving system.

Cancel claim 13.

Replace claims 14-24 with:

14. The computer readable storage medium as set forth in claim 21, wherein said simulating an oscillation includes:

creating equations of oscillation motion for a predetermined oscillation system in the gear driving system, using the one or more gear characteristic values set by the setting, and

solving the created equations of oscillation motion to determine a plurality of oscillation frequencies and a plurality of oscillation amplitudes of the oscillation system; and

judging the oscillations in the final gear as being within the acceptable ranges when at least one of the determined plurality of oscillation frequencies and the determined plurality of oscillation amplitudes of the oscillation system falls within its plurality of acceptable ranges.

15. The computer readable storage medium as set forth in claim 14, wherein the oscillation system used in the equation creating is a gear pair of the final gear and the driving gear of the final gear in the gear driving system.

16. The computer readable storage medium as set forth in claim 21, further comprising instructions for:

causing said simulating to be repeated to simulate another set of oscillations in the final gear of the gear driving system, based on the changed one or more gear characteristic values;

causing said judging to be repeated to judge whether or not the simulated oscillations of the another set in the final gear are within an acceptable ranges; and

in the case where it is judged that the simulated oscillations of the another set are not within the acceptable ranges, changing one or more of the gear characteristic values.

17. The computer readable storage medium as set forth in claim 16, further comprising instructions for:

in the case where it is judged that the simulated oscillations of the another set are within the acceptable ranges, outputting the changed one or more gear characteristic values on which

the simulated oscillations of the another set were based to a manufacturing unit for manufacturing the gear driving system or to a display terminal.

18. The gear driving system designing system as set forth in claim 2, wherein the judging means judges that a simulated oscillation in the final gear is not within its acceptable range when both of the oscillation frequency and the oscillation amplitude of that simulated oscillation are determined to be outside their acceptable ranges.

19. The computer implemented method as set forth in claim 8, wherein the judging step judges that a simulated oscillation in the final gear is not within its acceptable range when both of the determined oscillation frequency and the determined oscillation amplitude of that simulated oscillation are determined to be outside their acceptable ranges.

20. The computer readable storage medium as set forth in claim 14, wherein said judging includes:

judging that a simulated oscillation in the final gear is not within its acceptable range when both of the determined oscillation frequency and the determined oscillation amplitude of that simulated oscillation are determined to be outside their acceptable ranges.

21. A computer readable storage medium comprising computer executable instructions which when executed on a computer perform a process for designing a gear driving system, the medium comprising instructions for:

setting one or more gear characteristic values for a gear driving system, the gear characteristic values indicating characteristics of a final gear and a driving gear in the gear driving system for simulation of oscillations in the final gear of the gear driving system;

simulating oscillations in the final gear of the gear driving system, based on the one or more gear characteristic values set by said setting;

judging whether or not the simulated oscillations in the final gear are within acceptable ranges;

changing the one or more gear characteristic values previously set, when it is judged that the simulated oscillations in the final gear do not fall within the acceptable ranges;

wherein said setting, changing, simulating and judging are repeated until the simulated oscillations in the final gear are judged to fall within the acceptable ranges, and

when said judging judges that the simulated oscillations in the final gear are within the acceptable ranges, outputting the one or more gear characteristic values to a manufacturing unit for manufacturing the gear driving system or to a display terminal.

22. The gear driving system designing system as set forth in claim 1, wherein:

the gear characteristic values include at least one of (i) number of teeth, (ii) module, (iii) twist angle, (iv) pressure angle, and (v) tooth width of each of the final gear and the driving gear of the final gear.

23. The computer implemented method as set forth in claim 7, wherein:

the gear characteristic values include includes at least one of (i) number of teeth, (ii) module, (iii) twist angle, (iv) pressure angle, and (v) tooth width of each of the final gear and the driving gear of the final gear.

24. The computer readable storage medium as set forth in claim 21, wherein:

the gear characteristic values include at least one of (i) number of teeth, (ii) module, (iii) twist angle, (iv) pressure angle, and (v) tooth width of each of the final gear and the driving gear of the final gear.

Cancel claim 25.

A clean copy of allowed claims is attached.

Reasons for Allowance

4. Claims 1-3, 7-12 and 14-24 of the application are allowed over prior art of record.

5. The following is an Examiner's statement of reasons for the indication of allowable subject matter:

The closest prior art of record shows:

(1) a simulation model creation method and apparatus for systematically generating models that simulate operations of a component having a single function, a machine that

combines many components and a system that combines a plurality of machines which can be expressed by physical systems such as electrical, mechanical, fluid or solid state systems; the simulation models include linear and non-linear characteristic elements; a series connection of a plurality of elements is converted into a sum of characteristic elements; plurality of function simulation elements are integrated by substituting the inputs and outputs of many simulation models into inputs and outputs of one simulation model; mathematical models are used to model the functional simulation models; the relations between the functional simulation models and the mathematical models are displayed on a terminal; governing equations are developed and used to model the oscillations; these include equations for the gear train of a vehicle; the simulation is executed on a computer and the results are displayed on the computer terminal (**Sumida,** U.S. Patent Application 2003/0115037);

(2) the dynamics of a gear transmission system is evaluated by considering the deflections of the shafts and bearings and the deformation of the gears due to transmitted load; the moment of inertia, the shaft stiffness and the stiffness of the connected masses are included into the equations of motion in the dynamics analysis; a simplified damping model is used in the equations; time varying stiffness of the meshing gears cause vibrations; the tooth mesh frequency affects the dynamic response of the system; the equations are solved to find the natural frequencies of the system; the frequency analysis was performed using fast Fourier transformation of the time wave; the computer code DANST was modified and used to evaluate the dynamic response of spur gear pair in terms of dynamic stress; several gear parameters such as damping and contact ratios are varied in a wide range to determine their influence on gear

dynamics; the simulation results show the effects of individual parameters variations and can help the gear designer to choose optimum values of the gear parameters for minimum dynamic load and stress; (**Hs Lin et al.,** "A parametric study of spur gear dynamics", National Aeronautics and Space Administration, January 1998); and

(3) a color copier, color laser printer or similar color image forming apparatus including a belt driving means for moving an image transfer belt and photoconductive drums arranged side by side and driven by the belt; the system uses a gear train for reducing the output speed of the motor and a flywheel on the photoconductive drum, to reduce oscillations of the transmission system; this reduces the high frequency oscillations of the gears; the system provides a belt driving device that allows the rotary body and the belt to rotate together without oscillation; the system uses a relationship between the allowable limit of the amplitude of the oscillation of the drive system and the spatial frequency for attaining high image quality; if the spatial frequency due to oscillation of the drive line is high, the image quality is susceptible; the oscillation spatial frequency corresponds to the spatial frequency of torque ripples (**Koide,** U.S. Patent Application 2002/0085086).

None of these references taken either alone or in combination with the prior art of record discloses a gear driving system designing system, specifically including:

(Claim 1) "a judging means for judging whether or not the simulated oscillations in the final gear determined by the calculating means are within acceptable ranges;

a setting changing means for changing the one or more gear characteristic values set by the setting means, when the judging means judges that the simulated oscillations in the final gear do not fall within the acceptable ranges; and

wherein when said judging means judges that the simulated oscillations in the final gear are within the acceptable ranges, the one or more gear characteristic values corresponding to the simulated oscillations are output from the designing system to a manufacturing unit for manufacturing the gear driving system or to the display terminal".

None of these references taken either alone or in combination with the prior art of record discloses a computer implemented method for designing a gear driving system, specifically including:

(Claim 7) "a judging step of judging whether or not the simulated oscillations in the final gear are within acceptable ranges;

a setting changing step of changing the one or more gear characteristic values previously set in the setting step, when the judging step judges that the simulated oscillations in the final gear do not fall within the acceptable ranges; and

when the simulated oscillations in the final gear being judged fall within the acceptable ranges, outputting the one or more gear characteristic values to a manufacturing unit for manufacturing the gear driving system or to a display terminal".

None of these references taken either alone or in combination with the prior art of record discloses a computer readable storage medium comprising computer executable instructions

which when executed on a computer perform a process for designing a gear driving system, specifically including:

(Claim 21) "judging whether or not the simulated oscillations in the final gear are within acceptable ranges;

changing the one or more gear characteristic values previously set, when it is judged that the simulated oscillations in the final gear do not fall within the acceptable ranges; and

when said judging judges that the simulated oscillations in the final gear are within the acceptable ranges, outputting the one or more gear characteristic values to a manufacturing unit for manufacturing the gear driving system or to a display terminal".

6. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez, can be reached on 571-272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to TC 2100 Group receptionist: 571-272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

K. Thangavelu
Art Unit 2123
April 26, 2007

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